Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Analysis Report

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

April 15, 2011

Project: SUN: Philadelphia Refinery AOI-10

Submittal Date: 04/08/2011
Group Number: 1241313
PO Number: PHILADELPHIA
State of Sample Origin: PA

Client Sample Description	Lancaster Labs (LLI) #
W-32D_0-2' Grab Soil	6253863

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Langan	Attn: Dennis Webster
ELECTRONIC COPY TO	SUN: Aquaterra Tech.	Attn: Tiffani Doerr
ELECTRONIC COPY TO	LLI	Attn: EDD Group
ELECTRONIC COPY TO	Langan	Attn: Kristen Ward
ELECTRONIC COPY TO	Aquaterra Tech	Attn: Loretta Belfiglio

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Analysis Report

Questions? Contact your Client Services Representative
Jessica A Oknefski at (717) 656-2300 Ext. 1815

Respectfully Submitted,

Matthew E. Barton
Senior Specialist

Lancaster Laboratories

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Analysis Report

Sample Description: W-32D_0-2' Grab Soil
Philadelphia Refinery AOI-10
COC: 255058 W-32D_0-2'

LLI Sample # SW 6253863
LLI Group # 1241313
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-10

Collected: 04/07/2011 13:00 by SS

Submitted: 04/08/2011 14:10
Reported: 04/15/2011 09:35

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

W-32D

CAT No.	Analysis Name	CAS Number	Dry Result		Dry Method Detection Limit*	Dry Limit of Quantitation	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/kg**		**ug/kg**	**ug/kg**	
10950	Benzene	71-43-2	3	J	0.7	7	1.01
10950	1,2-Dibromoethane	106-93-4	N.D.		1	7	1.01
10950	1,2-Dichloroethane	107-06-2	N.D.		1	7	1.01
10950	Ethylbenzene	100-41-4	N.D.		1	7	1.01
10950	Isopropylbenzene	98-82-8	N.D.		1	7	1.01
10950	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.7	7	1.01
10950	Toluene	108-88-3	2	J	1	7	1.01
10950	1,2,4-Trimethylbenzene	95-63-6	N.D.		1	7	1.01
10950	1,3,5-Trimethylbenzene	108-67-8	N.D.		1	7	1.01
10950	Xylene (Total)	1330-20-7	N.D.		1	7	1.01
GC/MS Semivolatiles	**SW-846 8270C**		**ug/kg**		**ug/kg**	**ug/kg**	
10724	Anthracene	120-12-7	N.D.		240	1,200	5
10724	Benzo(a)anthracene	56-55-3	350	J	240	1,200	5
10724	Benzo(a)pyrene	50-32-8	430	J	240	1,200	5
10724	Benzo(b)fluoranthene	205-99-2	440	J	240	1,200	5
10724	Benzo(g,h,i)perylene	191-24-2	680	J	240	1,200	5
10724	Chrysene	218-01-9	440	J	240	1,200	5
10724	Fluorene	86-73-7	N.D.		240	1,200	5
10724	Naphthalene	91-20-3	N.D.		240	1,200	5
10724	Phenanthrene	85-01-8	420	J	240	1,200	5
10724	Pyrene	129-00-0	520	J	240	1,200	5
	Reporting limits were raised due to interference from the sample matrix.						
Metals	**SW-846 6020**		**mg/kg**		**mg/kg**	**mg/kg**	
06135	Lead	7439-92-1	1,200		0.181	3.49	25
Wet Chemistry	**SM20 2540 G**		**%**		**%**	**%**	
00111	Moisture	n.a.	29.7		0.50	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.						

General Sample Comments

PA DEP Lab Certification ID 36-00037, Expiration Date: 1/31/12

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10950	BTEX/MTBE/EDB/EDC/Cumene/TMBs	SW-846 8260B	1	X111021AA	04/12/2011 09:19	Stephanie A Selis	1.01

*=This limit was used in the evaluation of the final result

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Analysis Report

Sample Description: W-32D_0-2' Grab Soil
Philadelphia Refinery AOI-10
COC: 255058 W-32D_0-2'

LLI Sample # SW 6253863
LLI Group # 1241313
Account # 10132

Project Name: SUN: Philadelphia Refinery AOI-10

Collected: 04/07/2011 13:00 by SS

Submitted: 04/08/2011 14:10
Reported: 04/15/2011 09:35

SUN: Aquaterra Tech.
PO Box 744
West Chester PA 19381

W-32D

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035	1	201109824067	04/07/2011 13:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	1	201109824067	04/07/2011 13:00	Client Supplied	1
02392	L/H Field Preserved Bisulfate	SW-846 5035	2	201109824067	04/07/2011 13:00	Client Supplied	1
10724	PAH 8270 (microwave)	SW-846 8270C	1	11102SLE026	04/14/2011 11:23	Brian K Graham	5
10814	BNA Soil Microwave PAH	SW-846 3546	1	11102SLE026	04/13/2011 06:00	Joseph S Feister	1
06135	Lead	SW-846 6020	1	111011026001A	04/12/2011 22:25	David K Beck	25
11026	SW SW846 ICP-MS Digest	SW-846 3050B	1	111011026001	04/11/2011 20:48	Annamaria Stipkovits	1
00111	Moisture	SM20 2540 G	1	11103820003A	04/13/2011 20:31	Scott W Freisher	1

*=This limit was used in the evaluation of the final result

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Analysis Report

Quality Control Summary

Client Name: SUN: Aquaterra Tech. Group Number: 1241313
Reported: 04/15/11 at 09:35 AM

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL**	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X111021AA	Sample number(s): 6253863								
Benzene	N.D.	0.5	5	ug/kg	100	98	80-120	3	30
1,2-Dibromoethane	N.D.	1.	5	ug/kg	89	100	80-120	12	30
1,2-Dichloroethane	N.D.	1.	5	ug/kg	92	94	71-129	2	30
Ethylbenzene	N.D.	1.	5	ug/kg	99	97	80-120	2	30
Isopropylbenzene	N.D.	1.	5	ug/kg	98	96	76-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	5	ug/kg	82	90	74-121	9	30
Toluene	N.D.	1.	5	ug/kg	101	99	80-120	2	30
1,2,4-Trimethylbenzene	N.D.	1.	5	ug/kg	103	101	79-120	2	30
1,3,5-Trimethylbenzene	N.D.	1.	5	ug/kg	105	103	78-120	2	30
Xylene (Total)	N.D.	1.	5	ug/kg	98	97	80-120	1	30
Batch number: 11102SLE026	Sample number(s): 6253863								
Anthracene	N.D.	33.	170	ug/kg	100		83-111		
Benzo(a)anthracene	N.D.	33.	170	ug/kg	91		82-111		
Benzo(a)pyrene	N.D.	33.	170	ug/kg	97		63-138		
Benzo(b)fluoranthene	N.D.	33.	170	ug/kg	106		61-133		
Benzo(g,h,i)perylene	N.D.	33.	170	ug/kg	104		63-130		
Chrysene	N.D.	33.	170	ug/kg	94		81-111		
Fluorene	N.D.	33.	170	ug/kg	98		81-117		
Naphthalene	N.D.	33.	170	ug/kg	91		83-112		
Phenanthrene	N.D.	33.	170	ug/kg	98		83-109		
Pyrene	N.D.	33.	170	ug/kg	101		80-121		
Batch number: 111011026001A	Sample number(s): 6253863								
Lead	N.D.	0.0104	0.200	mg/kg	100		83-110		
Batch number: 11103820003A	Sample number(s): 6253863								
Moisture					100		99-101		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 11102SLE026	Sample number(s): 6253863 UNSPK: P250832								
Anthracene	264*	105	40-147	58*	30				
Benzo(a)anthracene	435*	109	32-150	56*	30				
Benzo(a)pyrene	389*	99	57-129	53*	30				
Benzo(b)fluoranthene	342 (2)	114 (2)	53-131	34*	30				
Benzo(g,h,i)perylene	229*	106	60-123	35*	30				

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

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Analysis Report

Quality Control Summary

Client Name: SUN: Aquaterra Tech. Group Number: 1241313
Reported: 04/15/11 at 09:35 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Chrysene	377*	112	76-114	49*	30				
Fluorene	181*	97	46-137	47*	30				
Naphthalene	210*	96	52-132	56*	30				
Phenanthrene	787 (2)	161 (2)	34-147	71*	30				
Pyrene	666 (2)	137 (2)	76-124	59*	30				
Batch number: 111011026001A	Sample number(s): 6253863 UNSPK: P252458 BKG: P252458								
Lead	108	101	75-125	2	20	4.06	4.30	6	20
Batch number: 11103820003A	Sample number(s): 6253863 BKG: P253875								
Moisture						17.8	17.6	1	15

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: TCL(4.3)by 8260(soil)
Batch number: X111021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6253863	89	97	103	93
Blank	96	101	98	101
LCS	92	100	109	103
LCSD	93	102	109	104
Limits:	71-114	70-109	70-123	70-111

Analysis Name: PAH 8270 (microwave)
Batch number: 11102SLE026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
6253863	87	88	82
Blank	103	110	108
LCS	101	110	103
MS	97	104	90
MSD	94	100	88
Limits:	55-121	56-121	43-124

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Analysis Request/ Environmental Services Chain of Custody

Lancaster Laboratories

For Lancaster Laboratories use only

Acct. # 10132 Group# 1241313 Sample # 6253863

COC # 255058

Please print. Instructions on reverse side correspond with circled numbers. 0.8-5.2°C

For Lab Use Only
FSC:
SCR#:

(1)
Client: SUN - AQUATERRA Acct. #:
Project Name/#: PHILA REF AOI-10 PWSID #:
Project Manager: T. DOERR P.O.#:
Sampler: S. SYICES Quote #:
Name of state where samples were collected: PA

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 O=Other

(6) Temperature of samples upon receipt (if requested)

(2) Sample Identification	Date Collected	Time Collected	(3) Grab	Composite	Matrix: Soil (Potable / NPDES)	Matrix: Water	Matrix: Other	(4) Total # of Containers	(5) Analyses Requested / Preservation Codes	Remarks
W-32B_0-2'	4/7/11	1300	X		X			4	*	* See attached sheet for analyses

(7) **Turnaround Time Requested** (TAT) (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

(8) **Data Package Options** (please circle if required)
Type I (validation/NJ Reg) TX TRRP-13
Type II (Tier II) MA MCP CT RCP
Type III (Reduced NJ)
Type IV (CLP SOW)
Type VI (Raw Data Only)
SDG Complete? Yes No
Site-specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal COC Required? Yes / No

(9) Relinquished by:	Date	Time	Received by:	Date	Time
AQT	4/7/11	1830	Sample Fridge	4/7/11	1830
	4/8/11	1108		4/8/11	1108
	4/8/11	1410			
				4/8/11	1410

10132|1241313|6253863 0.8-5.2

★ So. 1

Table 1b
Constituents of Concern for Soil
AOI 10 Work Plan for Site Characterization
Sunoco Philadelphia Refinery
Philadelphia, Pennsylvania

METALS	CAS No.
Lead (total)	7439-92-1

VOLATILE ORGANIC COMPOUNDS	CAS No.
1,2-Dichloroethane	107-06-2
1,2,4-Trimethylbenzene	95-63-6
1,3,5-Trimethylbenzene	108-67-8
Benzene	71-43-2
Cumene	98-82-8
Ethylbenzene	100-41-4
Ethylene dibromide	106-93-4
Methyl tertiary butyl ether	1634-04-4
Toluene	108-88-3
Xylenes (total)	1330-20-7

SEMI-VOLATILE ORGANIC COMPOUNDS	CAS No.
Anthracene	120-12-7
Benzo(a)anthracene	56-55-3
Benzo (g,h,i) perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzo(b)fluoranthene	205-99-2
Chrysene	218-01-9
Fluorene	86-73-7
Naphthalene	91-20-3
Phenanthrene	85-01-8
Pyrene	129-00-0

Notes:

1. Constituents are from Pennsylvania Corrective Action Process (CAP) Regulation Amendments effective December 1, 2001; provided in Chapter VI, Section E (pgs. 29-30) of PADEP Document, *Closure Requirements for Underground Storage Tank Systems,* effective April 1, 1998 and the March 18, 2008 revised PADEP Petroleum Short List.
2. Select soil samples to be collected within the CAMU and delineation soil samples will be analyzed for full TCL VOCs, TCL SVOCs, and TAL metals.

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
ug	microgram(s)	**mg**	milligram(s)
ml	milliliter(s)	**l**	liter(s)
m3	cubic meter(s)	**ul**	microliter(s)

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

J estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.